LYUBIMOV, A. L., LYKHACHEV, M. F., STAVINSKIY, V. S.,

"Gas Cerenkov Counters of the K -Meson Channel of the Syvchronophasotron"

paper presented at the Intl Conference on High Energy Physics, Rochester, N. Y. and/or Berkly California, 25 Aug - 16 Sep 1960.

Lyubimov, A.L.

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S/056/60/038/02/20/061
B006/B011

24.6810

AUTHORS: Virrasov, N. M., Vovenko, A. S., Vorob'yev, G. G., Kirillov, A. D., Kim Khi In, Kulakov, B. A., Lyubimov, A. L., Matulenko, Yu. A., Savin, I. A., Smirnov, Ye. V., Strunov, L. N., Chuvilo, I. V.

TITLE: Channel for Antiprotons With a Momentum of 2.8 Bev/c

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 2, pp. 445-448

TEXT: The authors of the present paper describe a channel built for the investigation of the interaction of antiprotons in a cloud chamber. Antiprotons were produced by 9-Bev protons in a target. Fig. 1 is a schematic representation of the channel described in the following. The antiprotons were identified from their velocity ($\beta = 0.95$) by means of three Cherenkov counters, each of which was provided with two photomultipliers of the type ФЭУ-33 (FEU-33) whose efficiencies are specified in Table 1. The efficiencies attained with different coincidence combinations are given in Tables 2 and 3. Fig. 2 shows a block diagram of the electronic

system, and respective data are supplied in Table 4. The efficiency of the scheme described with respect to antiprotons is found to be 60-40%. Some tests are briefly described next. By the system discussed here, the authors determined the ratio of the number of $\bar{p}$ with momenta of (2.8±15) Bev/c to the number of all remaining particles (which were chiefly π^--mesons from the beryllium target (36g/cm²) under the angles 0 and 7°, and from a copper target (~180 g/cm²) under 7° with respect to the primary proton beam (8.1 - 8.9 Bev). At an intensity of 10^9p of the inner beam, an average of 1 $\bar{p}$ was recorded within four minutes. Results:

Angle	target	proton beam intensity	particle number in the channel	relative number of antiprotons in the beam
0°	Be	10^9	1000	$(1.03\pm0.13).10^{-4}$
7°	Be	10^9	~700	$(1.37\pm0.18).10^{-4}$
7°	Cu	10^9	~700	$(2.42\pm0.53).10^{-4}$

The number of particles recorded in the channel agrees with data concern-

ing 9-Bev proton interactions in emulsions (Ref. 4). The increase in the relative number of antiprotons in the transition from 0 to 7° in the laboratory system agrees with predictions made on the strength of the statistical theory. By considering pion absorption ($\sigma_t \sim 30$ mb) and antiproton absorption ($\sigma_t \sim 60$ mb) as well as the attenuation of the beam of primary protons ($\sigma_{in} \sim 30$ mb), the ratio of the differential production cross sections of $\bar{p}$ and π^--mesons with 2.8 Bev/c under 0° in the laboratory system is found to be $\frac{d^2\sigma_{\bar{p}}}{d\omega dp} \Big/ \frac{d^2\sigma_{\pi}}{d\omega dp} \approx 1.5\cdot10^{-4}$.

There are 2 figures, 5 tables, and 4 references: 3 Soviet, 1 Italian, and 1 International (CERN).

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED: September 3, 1959

85357

S/120/60/000/005/030/051
E032/E314

21.5200

AUTHORS: Vovenko, A.S., Lyubimov, A.L., Savin, I.A., Stabinskiy, V.S. and Stoychev, T.T.

TITLE: A Cherenkov Counter Using Total Internal Reflection

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No. 5, pp. 119 - 121

TEXT: The counter is shown schematically in Fig. 1. The Cherenkov radiation produced by a charged particle passing through the radiator strikes the front end at various angles, depending on the velocity of the particle. For particles with a velocity $\beta_o = (n_1^2 - n_2^2)^{-1/2}$ the angle of incidence is equal to the angle of total internal reflection. The Cherenkov radiation due to particles with velocities greater than β_o experiences total internal reflection and is absorbed by the rear wall of the container which is covered by black velvet. In the case of particles having a velocity smaller than β_o, the radiation leaves the radiator and strikes two photomultipliers placed below the particle beam.

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85357

S/120/60/000/005/030/051
E032/E314

A Cherenkov Counter Using Total Internal Reflection

Each photomultiplier has a separate output and a special mirror is used to improve the light collection. The characteristics of the counter were investigated in the π^+ beam of the synchrocyclotron of the Laboratoriya yadernykh problem OIYaI (Laboratory for Nuclear Problems of the Joint Institute for Nuclear Studies). In the case of 2.8 GeV/C π^+ mesons the efficiency of the counter was found to be between 0.01 and 0.03, depending on the type of photomultiplier employed. A similar device has been described by Agnew et al in Ref. 2. However, the efficiency in the latter work was 0.1. Acknowledgments are expressed to V.I. Veksler for valuable advice. There are 2 figures and 3 references: 1 Soviet and 2 English.

ASSOCIATION: Ob'yedinennyy institut yadernykh issledovaniy (Joint Institute for Nuclear Studies)

SUBMITTED: September 2, 1959

Card 2/2

VIRYASOV, N.M.; VOVENKO, A.S.; VOROB'YEV, G.G.; KIRILLOV, A.D.; KIM KHI IN; KULAKOV, B.A.; LYUBIMOV, A.L.; MATULENKO, Yu.A.; SAVIN, I.A.; SMIRNOV, Ye.V.; STRUNOV, L.N.; CHUVILO, I.V.

Channel for 2.8 Bev/c momentum antiprotons. Zhur.eksp.i teor.fiz. 38 no.2:445-448 F '60. (MIRA 14:5)

1. Ob"yedinennyy institut yadernykh issledovaniy.
(Particle accelerators) (Protons)

BELYAKOV, A.N.; VOVENKO, A.S.; KIRILLOV, A.D.; KULAKOV, B.A.; LYUBIMOV, A.L.; MATULENKO, Yu.A.; SAVIN, I.A.

Gaseous threshold Cherenkov counters operating with accelerators. Prib. i tekh. eksp. 6 no.1:32-35 Ja-F '61. (MIRA 14:9)

1. Ob"yedinennyy institut yadernykh issledovaniy.
(Nuclear counters)

LYUBIMOV, A.I.

Remark on $\pi\Lambda$ - resonance. Zhur. eksp. i teor. fiz. 40 no.5:1520-1522 My '61. (MIRA 14:7)

1. Ob"yedinennyy institut yadernykh issledovaniy.
(Mesons—Scattering)
(Nuclear magnetic resonance)

VOVENKO, A.S.; KULAKOV, B.A.; LIKHACHEV, M.F.; LYUBIMOV, A.L.; MATYLENKO, Yu.A.; SAVIN, I.A.; STAVINSKIY, V.S.

[Differential Cherenkov gas counters] Differentsial'nyi gazovyi cherenkovskii schetchik. Dubna, Ob"edinennyi institut iadernykh issledovanii, 1961. 11 p. (MIRA 14:10)
(Nuclear counters)

P0627
S/120/61/000/001/008/0[illegible]
E032/E314

AUTHORS: Belyakov, A.V., Vovenko, A.S., Kirillov, V.D., Kulakov, B.A., Lyubimov, A.L., Matulenko, Yu. A. and Savin, I.A.

TITLE: Gas-filled Threshold Cherenkov Counters for Accelerator Experiments

PERIODICAL: Pribory i tekhnika eksperimenta, 1961, No. 1, pp. 32 - 35

TEXT: The velocity analysis of fast particles ($\beta \approx 1$) by Cherenkov counters, using the dependence of the threshold or angle of Cherenkov emission on the velocity, is possible if the refractive index of the medium is close to unity. This condition is satisfied only by gaseous media. The present paper describes two gas-filled Cherenkov counters. One of them (supplied by Yu.A. Troyan, L.S. Okhrimenko and S.V. Mukhin) was an experimental counter which was used in studies designed to establish whether it is possible to separate out rare particles against a background of other particles. The second counter was designed for work in the

Card 1/[illegible]

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E032/E314

Gas-filled Threshold ....

- and K-meson beams of the synchrophasotron of the Joint Institute for Nuclear Research. The first of the above counters is shown in Fig. 1, in which 1 - is the steel body, 2 - is a glass tube 30 mm in diameter and covered with a film of aluminium on the inner surface, 3 - is a hollow light pipe, 4 - is a perspex window and 5 - is an [illegible] (FEU-33) photomultiplier. Fig. 2 shows the second of the above counters, in which 1 is the steel body, 2 is a polished dural tube, 80 mm in diameter and coated with an organic film and then an aluminium film on the inner surface, 4 is a quartz window and 5 is an FEU-33 photomultiplier. The first counter (C_1) was used in the [illegible] meson beam of the synchrocyclotron of the Joint Institute of Nuclear Research. The energy was 300 MeV. The second counter (C_2) was used in the beam of positive particles of the synchrophasotron of the above institute (largely [illegible]-mesons and protons) the momentum being [illegible] GeV/c. In both cases, the Cherenkov counter was

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Gas-filled Threshold ....

connected in coincidence with a scintillation monitor telescope whose counters had a diameter slightly smaller than the diameter of the Cherenkov counter. The Cherenkov counter was arranged as shown in Fig. 3. C in this figure represents the scintillation counters, VP -la represent amplifiers, the rectangular block in the centre of the figure indicates the position of the Cherenkov counter and the three rectangular blocks on the righthand side of the figure are coincidence circuits with resolving times as indicated. In these experiments the ratio $m = N_2/N_1$ was measured. Fig. 4 shows the ratio m as a function of pressure in atmospheres for the C_1 counter (filled with air). Curve a refers to a kinetic energy $T_k^{\pi} = 207$ MeV and Curve b to $T_k^{\pi} = 280$ MeV. p_a^a, p_a^b, p_μ^a, p^b indicate the threshold pressures of the a and b curves for π- and μ-mesons, respectively. Curve b was taken with a telescope containing a Cherenkov counter which was more sensitive to μ-mesons than π-mesons.

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E032/E314

Gas-filled Threshold ....

Fig. 5 shows the ratio m as a function of pressure in atm. for the C_1 counter filled with ethylene (E_{γ} = 392 MeV). It is clear from Figs. 4 and 5 that it is possible to separate out -mesons in a beam of -mesons. Fig. 6 shows the dependence of m on the pressure for the C_2 counter filled with air. This curve was obtained for a beam containing 40% -mesons and 60% protons. p and p show the threshold pressures for - and -mesons. It is concluded that particle separation is possible with these counters. There are 6 figures and 1 non-Soviet reference.

ASSOCIATION: Ob'yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED: February 13, 1960

Card 4/4

VOVENKO, A.S.; GOLOVANOV, L.B.; KULAKOV, B.A.; LYUBIMOV, A.L.; MATULENKO, Yu.A.; SAVIN, I.A.; SMIRNOV, Ye.V.

[Total cross sections of π^--meson interaction with protons at high energies] Polnye secheniia vzaimodeistviia π^--mezonov s protonami pri vysokikh energiiakh. Dubna, Ob"edinennyi institut iadernykh issledovanii, 1961. 11 p. (MIRA 14:11)
(Mesons) (Protons)

S/120/62/000/002/009/047
E039/E520

AUTHORS: Vovenko, A.S., Kulakov, B.A., Likhachev, M.F., Lyubimov, A.L., Matulenko, Yu.A., Savin, I.A. and Stavinskiy, V.S.

TITLE: A differential gas Cherenkov counter

PERIODICAL: Pribory i tekhnika eksperimenta, no.2, 1962, 49-52

TEXT: A detailed description is given of a differential gas Cherenkov counter developed in the high energy laboratory of OIYaI in 1959 and used in the beam of the synchrophasotron for the detection of K-mesons in pulses of 3-5 GeV. Cherenkov radiation from particles moving through the gas in the counter is focused by a spherical aluminium coated mirror onto a circular diaphragm placed in front of a perspex plug through which the light passes and is detected with a ФЭУ-24 (FEU-24) photomultiplier. The plane of the photocathode is perpendicular to the direction of the particle beam, which has a maximum diameter of 10 cm, and the axis of the photomultiplier is displaced about 12 cm from it. A more detailed discussion of the optical aberrations is given. The radiation tube is about 1.5 m long and is lined with black velvet to reduce the background count; this

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A differential gas Cherenkov counter S/120/62/000/002/009/047
E039/E520

reduced the effective working length to 0.7 m. A photomultiplier with high quantum efficiency and large amplification is necessary and the electronic circuitry is sensitive to a pulse corresponding to one photoelectron from the cathode of the photomultiplier. The variation of efficiency with air pressure was determined and it is shown that a background count appears at pressures greater than $\sim$ 25 atm. This background can be reduced further, to $\sim$ 1 to 2%, by using gases such as ethane and ethylene. Peak efficiency is at about 10 atm for air and K-mesons and π -mesons can be separated in pulses up to 6 GeV/s. There are 4 figures.

ASSOCIATION: Ob'yedinennyy institut yadernykh issledovaniy (Joint Institute for Nuclear Research)

SUBMITTED: August 17, 1961

Card 2/2

3

38559
S/056/62/042/003/011/049
B104/B102

24.6600

AUTHORS: Vovenko, A. S., Golovanov, L. B., Kulakov, B. A., Lyubimov, A. L., Mamulenko, Yu. A., Savin, I. A., Smirnov, Ye.V.

TITLE: Total π^--p interaction cross sections at high energies

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 3, 1962, 715 - 720

TEXT: $\sigma_t(\pi^-, p)$ was determined for proton momenta of 3.4, 3.9, 4.9, 7.0, and 9.2 Bev/c. The experimental arrangement is shown in Fig. 1. The total interaction cross section decreased between 3.5 and 7 Bev/c. Measurements at higher energies have not clearly shown whether the decrease of $\sigma_t(\pi^-, p)$ is only characteristic of the range investigated, or the behavior is an asymptotic one (Table). A comparison with other results has shown that $\sigma_t(\pi^+, p)$ and $\sigma_t(\pi^-, p)$ are equal in the range of 4-5 Bev within the accuracy attained. Assuming that $\sigma_\pi/\sigma_y = (\mathrm{Im}A_\pi^o/\mathrm{Im}A_y^o)^2$, the charge exchange is estimated with the aid of relation

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$$4\pi\lambda \operatorname{Im} A_n^0 = (1/\sqrt{2})\,|\sigma_t(\pi^-, p) - \sigma_t(\pi^+, p)|$$

$\sigma_{\pi} = 0.012$ and 0.003, respectively. A_{π}^0 and A_{γ}^0 are the amplitudes of the charge exchange processes ($\pi^0 p \to \pi^+ n$, $\pi^- p \to \pi^0 n$) and of the elastic scattering under the angle 0°, σ_{π} and σ_{γ} are the total charge exchange cross section and the elastic scattering cross section. The two values of σ_{π} were obtained at $\sigma_{\gamma} \approx 5.5$ millibarn with $\sigma_t(\pi^-, p) - \sigma_t(\pi^+, p) = 1$ millibarn, and $\sigma_t(\pi^-, p) - \sigma_t(\pi^+, p) = 2$ millibarn, respectively. The data of other authors (G. von Dardel et al., Phys. Rev. Lett., 7, 127, 1961) are in good agreement with the results obtained here. I. Ya. Pomeranchuk and L. B. Okun' are mentioned. There are 2 figures, 1 table, and 17 references: 11 Soviet and 6 non-Soviet. The four most recent references to English-language publications read as follows: V. N. Gribov, Nucl. Phys., 22, 249, 1961; G. von Dardel et al., Phys. Rev. Lett., 5, 333, 1960; A. S. Vovenko et al., Proc. of the 1960 Ann. Intern. Conf. on High Energy Physics at Rochester, Univ. of Rochester, 1960, p. 443; V. S. Barashenkov et al., Nucl. Phys., 14, 522, 1960.

Total π^--p interaction cross...

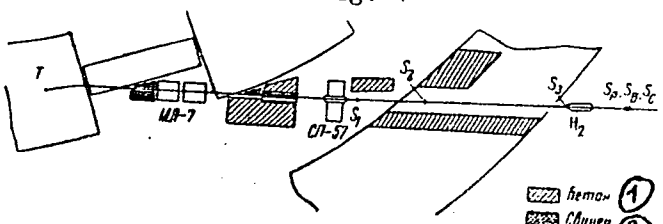
S/056/62/042/003/011/049
B104/B102

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED: October 10, 1961

Fig. 1. Experimental arrangement.

Fig. 1



Legend: (T) target in the proton-synchrotron; (МЛ-7 (ML-7)) four-pole lenses; (СП-57 (SP-57)) magnet; (S_1, ..., S_3, S_A, ..., S_C) scintillation counters; (1) concrete; (2) lead.

Table. Measurement results.

Table

(1)	(2)	(3)
3,4	31,4±0,7	12,4±0,2
3,9	30,0±0,5	12,8±0,2
4,9	29,6±0,0	13,3±0,2
7,0	27,8±0,8	6,5±0,4
9,2	25±4	

Legend: (1) momenta of π^- mesons, Bev/c; (2) $\sigma_t(\pi^-, p)$, millibarn; (3) muon admixture in the beam, %.

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LYUBIMOV, A.L.

Inclination of the diffraction curves of pp^-, $\bar{p}p^-$, K^+p^-, K^-p^-, π^+p^- and π^-p scattering as dependent on the energy. Pis'. v red. Zhur. eksper. i teoret.fiz. 2 no.3:125-129 Ag '65.

(MIRA 18:12)

1. Ob"yedinennyy institut yaderrykh issledovaniy. Submitted June 11, 1965.

L 11946-66 EWT(m)/T/EWA(m)-2

ACC NR: AP6000736 SOURCE CODE: UR/0386/65/002/009/0409/0413

44,55 44,55 44,55 44,55 44,55

AUTHOR: Vovenko, A. S.; Gus'kov, B. N.; Likhachev, M. F.; Lyubimov, A. L.; Matulenko, Yu. A.; Savin, I. A.; Stavinskiy, V. S.

44,55 44,55

ORG: Joint Institute of Nuclear Research (Ob"yedinennyy institut yadernykh issledovaniy) 44,55

TITLE: Elastic 180° scattering of π^+ mesons by protons at high energies 44,55 45 47

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 9, 1965, 409-413 B

TOPIC TAGS: elastic scattering, pion scattering, proton scattering, scattering cross section

ABSTRACT: This is a continuation of earlier measurements of the differential cross sections for elastic π^+p scattering in a small solid angle about 180° at π^+-meson l.s. momenta 3.15, 4.10, and 4.85 Gev/c, carried out at the High Energy Laboratory of the Joint Institute for Nuclear Research, the results of which for 3.15 Gev/c have already been published (Phys. Lett. v. 17, 68, 1965). In this paper the authors present the results for 4.10 and 4.85 Gev/c and compare the data obtained at all three energies. The measurements at the different energies were made with the same setup, which was already described earlier. The ratio of the number of elastic π^+-meson backward-scattering events registered by the apparatus to the total number of obtained photographs decreased with increasing energy (1:4.4, 1:11, and 1:40 at 3.15, 4.10, and 4.85 Gev/c, respectively). This was due not only to the decrease in the measured

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ACC NR: AP6000736

cross section, but to a deterioration of the background conditions as a result of the smaller spatial separation of the recoil protons from the beam particles. It was therefore required to apply more rigorous criteria for the selection of the backward elastic-scattering events than earlier. The effective c.m.s. solid angle of the set-up, calculated by the Monte Carlo method with account of the Coulomb scattering of the particles, was 3.87×10^{-3} sr for 4.10 Gev/c and 3.04×10^{-3} sr for 4.85 Gev/c. The effective cross sections, corrected for the nuclear interaction of the primary and back-scattered π^+ mesons and the recoil proton in the hydrogen target and in the counters, for the muon contamination of the beam, for decay of the scattered pion, for the efficiency of the scintillation counters and the electronic circuitry, and for the efficiency of the spark chambers, were (99 ± 12), (74 ± 11), and (37 ± 12) μb/sr for 3.15, 4.10, and 4.85 Gev/c, respectively. The previously deduced existence of a narrow peak of appreciable magnitude in the differential cross section of elastic π^+p backward scattering at 3.15 Gev/c is confirmed. Authors thank V. Birulev, T. Dobrovol'skiy, A. Zagorodnyi, I. Kakurin, V. Perevozchikov, and N. Chernyshov for help with the work, V. Kochkin for compiling the program and performing the computations, the proton synchrotron crew for stable operation of the accelerator, and the operating staff of the cryogenic division for supplying the liquid hydrogen. Orig. art. has: 1 figure, 1 formula, and 1 table.

SUB CODE: 20/ SUBM DATE: 15Sep65/ OTH REF: 002

HW

SOKOLOV, Fedor Mikhaylovich; LYUBIMOV, Anatoliy Nikolayevich; STARCHAKOVA, I.I., red.; SOKOLOVA, N.N., tekhn. red.

[Commercial and financial plan for food stores; management planning] Torgovo-finansovyi plan prodovol'stvennogo magazina; planirovanie khoziaistvennoi deiatel'nosti. Moskva, Gos. izd-vo torg. lit-ry, 1958. 173 p. (MIRA 11:7)

(Food industry)

Lyubimov, A.N.

49-1-9/16

AUTHORS: Birkgan, A.Yu and Lyubimov, A.N.

TITLE: Preliminary Calculation of the Chart AT-700, using the "Strela" Electronic Digital Computer (Predvychisleniye karty AT-700 na elektronnoy tsifrovoy mashine "Strela")

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1958, Nr 1, pp.93-99 (USSR)

ABSTRACT: An attempt is described of programming one of the problems of dynamic meteorology. A scheme of numerical solution of the problem as first worked out by S.L.Belousov, is given as well as the order and organisation of the solution on the "СТРЕЛА" computer. The aim of the work was to prepare a daily forecast. Information is given on the calculating capacity and elements of programming of this machine. This is a continuation of the work first reported by the first of the present authors (Ref.1). The wind equation at the mean level of the atmosphere is written in the form:

$$\Delta \frac{\partial z'}{\partial t} = -A \quad \text{(Eq.1)},$$ where Δ is the Laplace operator, z is the height of the isobaric surface, which is identical with the mean atmospheric level,

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Preliminary Calculation of the Chart AT-700, using the "Strela" Electronic Digital Computer.

$A = \frac{g}{l}(z, \Delta z) + \beta \frac{\partial z}{\partial x}$, the advection of the absolute wind, $l = 2\omega \sin\varphi$, g is the acceleration due to gravity, l is the coriolis parameter, ω is the angular velocity of the earth, φ is the latitude, $\beta = \frac{2\omega \cos\varphi}{a}$, and a is the radius of the Earth; also:

$$(z, \Delta z) = \frac{\partial z}{\partial x}\Delta\frac{\partial z}{\partial y} - \frac{\partial z}{\partial y}\Delta\frac{\partial z}{\partial x} .$$

The parameters g, l, β are assumed to be constant. The field $z(x, y)$ of the isobaric surface $p = 700$ m bar over some limited territory is taken to be the initial condition. As was shown in (Ref.1), (Eq.1) can be put into the form :

$$\Delta\frac{\partial z}{\partial t} = -\frac{g}{l}(z, B) - \beta\frac{\partial z}{\partial x} \qquad \text{(Eq.2)}$$

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Preliminary Calculation of the Chart AT-700, using the "Strela" Electronic Digital Computer.

$$\frac{\partial B}{\partial t} = \Delta \frac{\partial z}{\partial t} + \frac{4}{L^2} \frac{\partial z}{\partial t} \qquad \text{(Eq.3)}$$

where $B = \Delta z + \frac{4z}{L^2}$. The differential equations (2) and (3) are re-expressed in the form of difference equations which can be used with the above computer. The arithmetical device in the machine operates on numbers which can be put into the binary form:

$x = \pm q_x 2^{\pm p_x}$. The machine performs 2000 operations per sec. A list of the operations performed by the machine is given. A single prediction of the AT-700 chart takes 3.5 minutes, the number of operations carried out by the machine being 300 000. An example of the predicted and measured pressure distributions for 06 hours, 8.12.1956 is given in Fig.3, where the continuous lines are the predicted ones and the dashed lines are those actually measured.

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Preliminary Calculation of the Chart AT-700, using the "Strela" Electronic Digital Computer.

The best agreement was obtained for the central parts of the territory under consideration. Fig.2 shows the map at 06 hours, 7.12.1956 whose isobars were used to predict those in Fig.3.
There are 3 figures, 3 tables and 2 Slavic references.

SUBMITTED: January 1, 1957.

AVAILABLE: Library of Congress.

Card 4/4

LYUBIMOV, A.N.

PHASE I BOOK EXPLOITATION SOV/5855

Kibardin, Yu. A., S. I. Kuznetsov, A. N. Lyubimov, and B. Ya Shumyatskiy

Atlas gazodinamicheskikh funktsiy pri bol'shikh skorostyakh i vysokikh temperaturakh vozdushnogo potoka (Atlas of Gas Dynamic Functions for High Air-Flow Speed and High Temperature) Moscow, Gosenergoizdat, 1961. 327 p. Errata slip inserted. 6000 copies printed.

Ed. (Title page): A. S. Predvoditelev, Corresponding Member, Academy of Sciences USSR; Ed.: A. S. Meleyev; Tech. Ed.: N. I. Borunov.

PURPOSE : This atlas is intended for design bureaus and scientific research organizations concerned with the design of gas turbines and rocket engines and also with problems associated with combustion processes and the utilization of atomic energy. It may also be useful to students in beginning and advanced courses in schools of higher technical

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education.

COVERAGE: The manual presents necessary material for the solution of basic gasdynamic problems for airflow while taking into consideration variable specific heat, dissociation, and partial ionization. This material encompasses a pressure range from 10^{-6} to 10^{3} kg/cm^2 for temperatures up to 20,000°K. In addition, the book presents in detail the gasdynamic functions of an ideal gas ($\kappa = 1.4$) which facilitate the determination of low parameters for isoentropic flow, shock waves, and flow around circular cones. Part I contains diagrams of the state and kinetic coefficients of the dissociating air. Part II presents graphs and diagrams which contain the calculation results of isoentropic flows and shock waves while taking into account the variable specific heat of the air. Part III gives the gasdynamic functions of an ideal gas ($\kappa = 1.4$) in the presence of oblique shock waves and for axial flow around circular cones which permit the determination of flow parameters at the cone surface as well as the velocity-, pressure-, and

mass-flow fields for axial flow around circular cones with vertex half angles of 5 - 50°. Determinations of parameter values with an accuracy sufficient for the solution of most practical problems may be made with the aid of included diagrams. The appendixes present detailed tables of gasdynamic functions for an ideal gas at $\kappa = 1.4$ and M numbers from 0 to 100, and also tables of approximating polynomials of conical flows which aid in determining velocity fields and individual mass flows with an accuracy up to the fifth decimal. The latter tables may be used for investigating more general problems of gasdynamics with the aid of electronic digital computers. The authors thank Professor G. F. Burago, Doctor of Technical Sciences, M. Ye. Kozhenkova, S. S. Nalbandyan, K. M. Samoshkina, and L. N. Turkina. There are 11 references: 8 Soviet (including 1 translation) and 3 English.

TABLE OF CONTENTS:

AVAILABLE: Library of Congress

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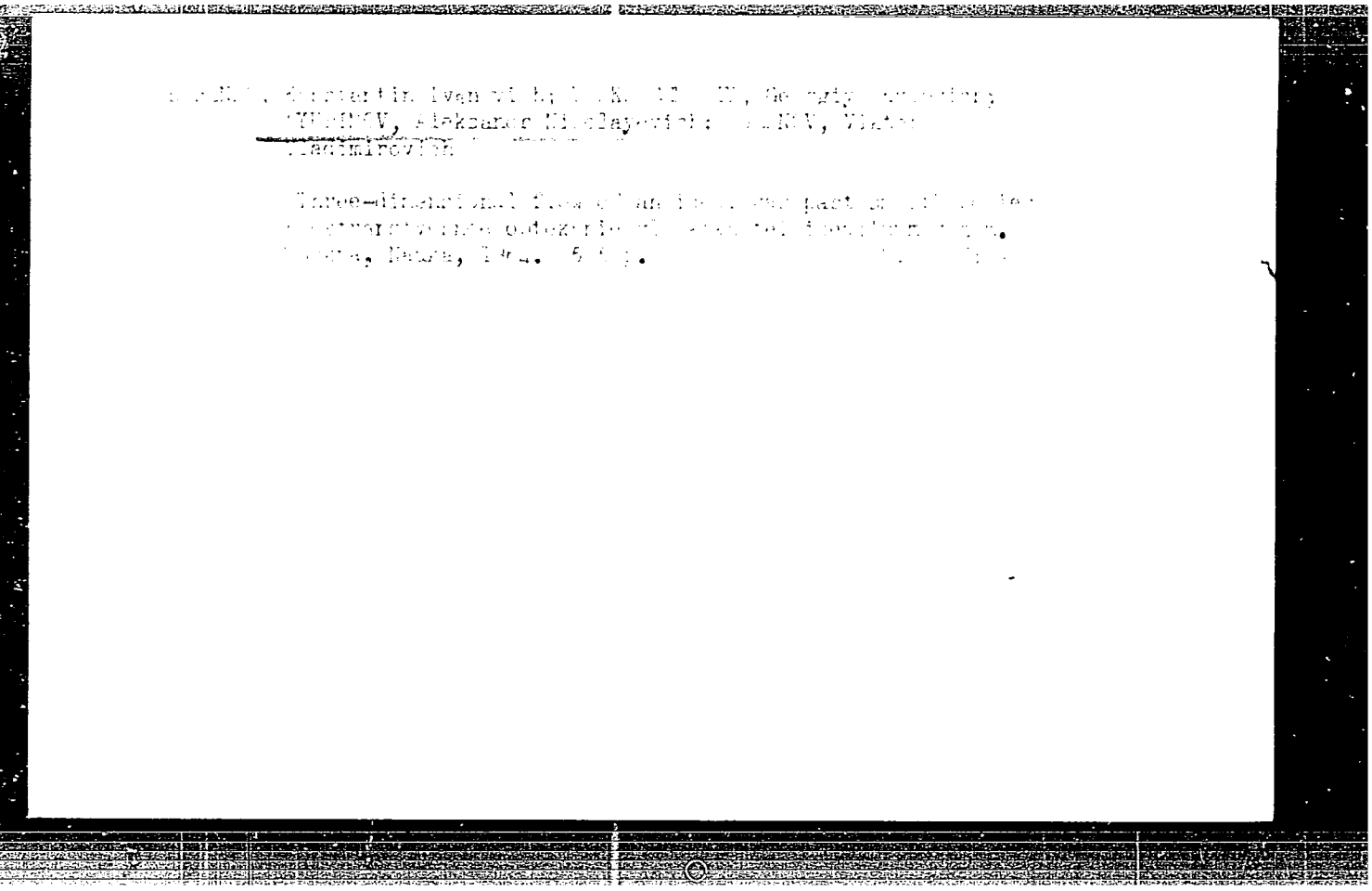
IS/rsm/jw
1/8/62



15 9450
11.2214

26182
S/190/61/003/010/011/019
B124/B110

AUTHORS: Lyubimov, A. N., Novikov, A. S., Galil-Ogly, F. A., Gribacheva, A. V., Varenik, A. F.

TITLE: Application of nuclear magnetic resonance to studies of rubber-like fluorine-containing polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 10, 1961, 1511 - 1515

TEXT: The authors determined the temperature dependence of the width of nuclear magnetic resonance bands and the second moment in fluorine-containing rubber-like polymers of different elastic properties. The following copolymers were investigated: trifluoro chloro ethylene and vinylidene fluoride (I); hexafluoro propylene and vinylidene fluoride (II); trifluoro chloro ethylene, vinylidene fluoride, and perfluoro methoxy perfluoro propyl acrylate (III); homopolymer of perfluoro methoxy perfluoro propyl acrylate (IV); and polyhexafluoro pentamethylene adipate (V). A nuclear magnetic resonance spectrometer of the usual type having linear scanning and sinusoidal modulation of the polarization field and autodyne nuclear signal pick-up was used for measurement. The field

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Application of nuclear...

homogeneity determined from the resolution of chemical resonance shifts of F^{19} was 10^{-5} within 0.5 cm^3. For all polymers investigated, the derivatives of the resonance absorption bands of protons and fluorine between -150 and +120°C were recorded. The second moments of the resonance bands of protons and fluorine were calculated by graphic integration, and their temperature dependence was recorded (Fig. 1). Below -110°C, the second moments measured correspond to those of the solid structures (16 - 19.5 $gauss^2$) and decrease with rising temperature, the course for all polymers, except for (V), being identical. The curves obtained show three sections: (1) Constant values of the second moment; (2) slow decrease of these values; and (3) rapid decrease of the second moment. The boundary of the first and the beginning of the second section is for all polymers at -110°C; the end of the second and the beginning of the third section is for (I) and (II) at -20°C, for (III) and (IV) at -40°C, and for (V) at about -60°C. These temperatures correspond to the vitrification points of the respective copolymers which had been determined by Kargin's dynamometer. Above the temperatures mentioned, a mobility of the molecular chain segments appears, whereas

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28182
S/190/61/003/010/011/019
B124/B110

Application of nuclear

in polymer (V) the chains, due to the presence of "hinge" OCO-groups, are more mobile than in other polymers and their heat motion sets in almost simultaneously with the beginning of re-orientation of the CH_2 groups.

Besides the rotary motions of the individual groups, also some heat motions of chain segments appear in the molecule chains of the polymers studied. By comparing the experimentally determined and the theoretically calculated second moments of hydrogen and fluorine for the copolymer of vinylidene fluoride and trifluoro chloro ethylene, it was proved that, for the two possible compounds of the monomers $-CF_2-CFCl-$ and $-CH_2-CF_2-$, the structure $-CF_2CFClCF_2CH_2-$ is more probable than the structure $-CF_2CFClCH_2CF_2-$. A chemical resonance shift of fluorine from (II) caused by the groups CF_2 and CF_3 was observed at $+90^{\circ}C$. A. I. Kitaygorodskiy is thanked for his advice. There are 1 figure and 8 references: 1 Soviet and 7 non-Soviet. The two most important references to English-language publications read as follows: W. P. Slichter, J. Appl. Phys. 26, 1099, 1955; W. P. Slichter, J. Polymer Sci. 106, 178, 1957.

Card 3/5

28182
S/190/61/003/010/011/019
B124/B110

Application of nuclear .

ASSOCIATION: Nauchno-issledovatel skiy institut rezinovoy promyshlennosti (Scientific Research Institute of the Rubber Industry)

SUBMITTED: November 17, 1960

Fig. 1. Change of the second moment for fluorine (a) and hydrogen (б) as dependent on the temperature for the copolymers: (1) vinylidene fluoride with trifluoro chloro ethylene; (2) vinylidene fluoride with hexafluoro propylene; (3) homopolymer of perfluoro methoxy perfluoro propyl acrylate; (4) vinylidene fluoride with trifluoro chloro ethylene and perfluoro methoxy perfluoro propyl acrylate; (5) polyhexafluoro pentamethylene adipate

Legend: (A) temperature °C; (B) ΔH^2 gauss^2

Card 4/5

S/032/62/028/008/010/014
B104/B102

AUTHORS: Lyubimov, A. N., Varenik, A. F., and Slonim, I. Ya.

TITLE: The nuclear magnetic resonance spectrometer of the TsLA and its tests

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 8, 1962, 991 - 995

TEXT: At the Central Automation Laboratory a nuclear magnetic resonance spectrometer for broad lines was developed for industrial purposes. Two prototypes were built, one of which was tested at the Automation Laboratory and the other at the Institute of Plastics. The spectrometer has three main components: the magnet system, the supply system for the magnet with temperature control, and the recording apparatus. The nuclear magnetic resonance of the fluorine nuclei in calcium fluoride was determined in order to test the utility of the instrument. For the second moment of the nuclear magnetic resonance line, a value was found which deviates by 2% from those already known. A quick method for arriving at the degree of moisture in caprone was developed in the course of investigating various polymers. A special receiver for nuclear magnetic resonance signals and a

Card 1/2

The nuclear magnetic resonance...

special automatic stabilization of the magnetic field were developed for high resolution work. The nuclear magnetic resonance spectrum can be recorded within 2 minutes and the resolving power is $2 \cdot 10^{-6}$. There are 6 figures.

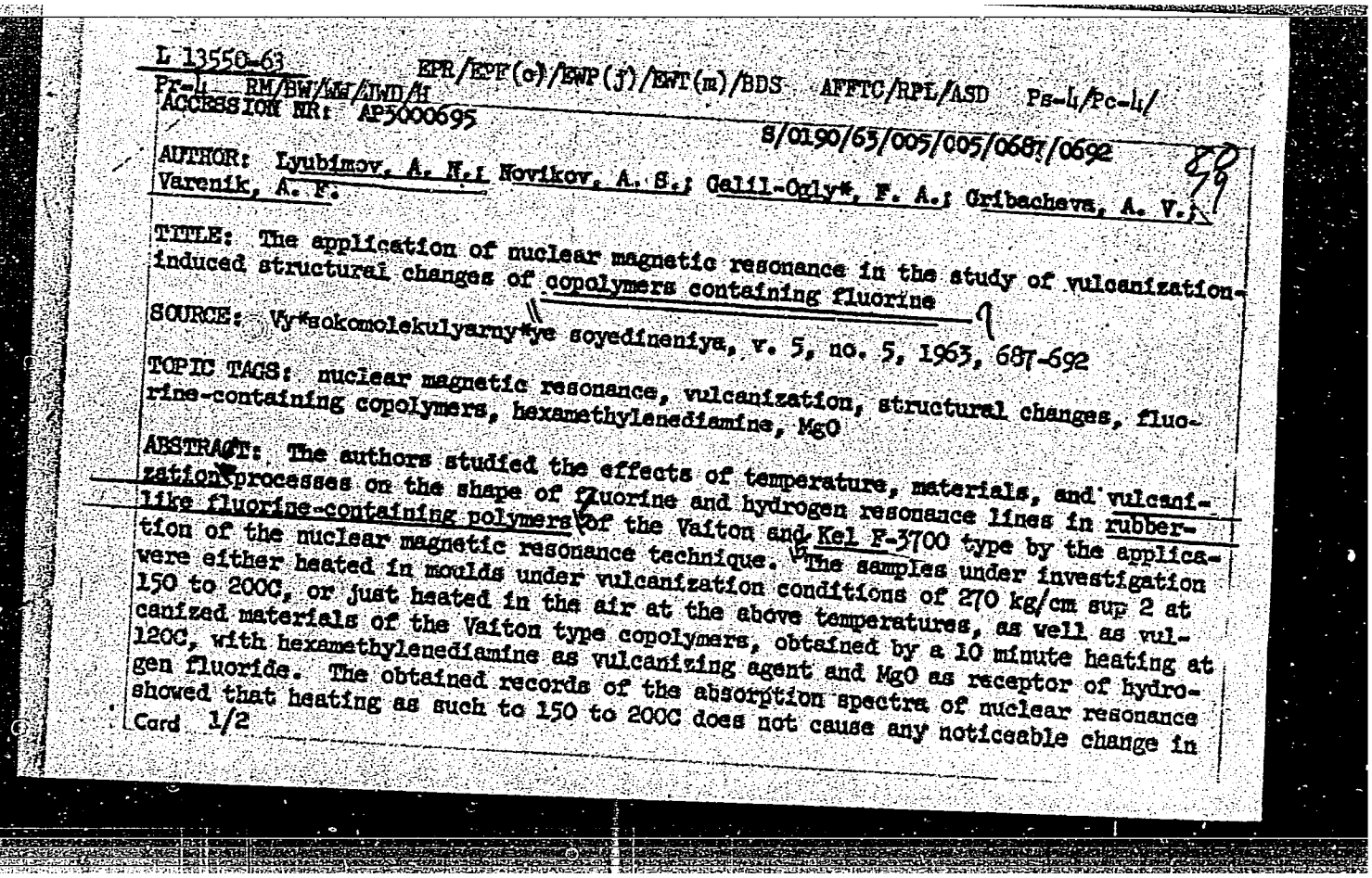
ASSOCIATION: Tsentral'naya laboratoriya avtomatiki (Central Automation Laboratory) Nauchno-issledovatel'skiy institut plastmass (Scientific Research Institute of Plastics)

Card 2/2

LYUBIMOV, A.N.; VARENIK, A.F.; FEDIN, E.I.

Nuclear magnetic resonance spectrometer of high resolution of the central automation laboratory. Zhur.strukt.khim. 4 no.6: 919-923 N-D '63. (MIRA 17:4)

1. TSentral'naya laboratoriya avtomatiki, Institut elementoorganicheskikh soyedineniy AN SSSR.



L 13550-63 EPR/EPF(c)/EWP(j)/EWT(m)/BDS AFFTC/RPL/ASD Ps-4/Pc-4/
Pr-4 RM/BW/WW/LWD/AT
ACCESSION NR: AP3000695 S/0190/63/005/005/0687/0692

AUTHOR: Lyubimov, A. M.; Novikov, A. S.; Celil-Ogly*, F. A.; Gribacheva, A. V.; Varenik, A. F.

TITLE: The application of nuclear magnetic resonance in the study of vulcanization-induced structural changes of copolymers containing fluorine

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 5, no. 5, 1963, 687-692

TOPIC TAGS: nuclear magnetic resonance, vulcanization, structural changes, fluorine-containing copolymers, hexamethylenediamine, MgO

ABSTRACT: The authors studied the effects of temperature, materials, and vulcanization processes on the shape of fluorine and hydrogen resonance lines in rubber-like fluorine-containing polymers of the Vaiton and Kel F-3700 type by the application of the nuclear magnetic resonance technique. The samples under investigation were either heated in moulds under vulcanization conditions of 270 kg/cm sup 2 at 150 to 200C, or just heated in the air at the above temperatures, as well as vulcanized materials of the Vaiton type copolymers, obtained by a 10 minute heating at 120C, with hexamethylenediamine as vulcanizing agent and MgO as receptor of hydrogen fluoride. The obtained records of the absorption spectra of nuclear resonance showed that heating as such to 150 to 200C does not cause any noticeable change in

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L 13550-63

ACCESSION NR: AP3000695

the shape of fluorine and hydrogen lines, while heating the samples under vulcanization conditions causes some change in the shape of the fluorine lines and a very marked one in the hydrogen lines in both copolymers, these changes being independent of the temperature. The effect of the amine vulcanization is still more pronounced as to the fluorine lines, while causing a radical change in the shape of the hydrogen resonance lines, these changes being independent of the concentration of hexamethylenediamine. The incorporation of MgO in the vulcanization compound causes a widening of the fluorine line without markedly affecting the hydrogen line. It is concluded that the observed changes may indicate the formation in the polymeric chains of C = C double bonds. Orig. art. has: 6 figures.

ASSOCIATION: Nauchno-issledovatel'skiy institut rezinovoy promy*shlennosti (Scientific Research Institute of the Rubber Industry)

SUBMITTED: 16Oct61 DATE ACQ: 17Jun63 ENCL: 00

SUB CODE: CH NO REF SOV: 006 OTHER: 000

Card 2/2

SLONIM, I.Ja [Slonim, I.Ya.] (Moskva); LJUBIMOV, A.N. [Lyubimov, A.N.] (Moskva); KOVARSKAJA, B.M. [Kovarskaya, B.M.] (Moskva)

Study of curing and destruction of epoxy resins by nuclear magnetic resonance. Chem prum 13 no.11:606-608 N'63.

L 51051-65 EWT(1)/EWP(m)/EWA(d)/FCS(k)/EWA(1) Pd-1
ACCESSION NR AM5005931 BOOK EXPLOITATION S/ 36 B+1

Babenko, Konstantin Ivanovich (Professor); Voskresenskiy, Georgiy Pavlovich; Lyubimov, Aleksandr Nikolayevich; Rusanov, Viktor Vladimirovich

Spatial flow of ideal gas around cones (Prostranstvennoye obtekaniye gladkikh tel ideal'nym gazom), Moscow, Izd-vo "Nauka", 1964, 505 p. illus., tables. Errata printed on the inside of back cover. 3,500 copies printed.

TOPIC TAGS: ideal gas flow, gas dynamics, supersonic flow, axisymmetric flow, mathematics, computer programming, aerodynamics

PURPOSE AND COVERAGE: This book is devoted to an actual problem of modern gas dynamics--calculating the field of flow around a smooth body placed arbitrarily in relation to the direction of air flow. The book cites the results of research conducted for a number of years between authors on the development and practical application of a method of finite differences for solution of spatial problems of gas dynamics on electronic digital computers. The first chapter is a detailed presentation of the method of spatial flow around sharp bodies by a supersonic gas flow. A number of sections of the first chapter contain theoretical research on systems of finite difference equations conducted with a consideration of applying the method to contain problems of mechanical and mathematical

Card 1/3

L 51051-65
ACCESSION NR AM5005931

physics. The second chapter presents the results of calculations of non-axisymmetric flow around several rotating bodies with and without consideration of chemical regulations in the flow. The third chapter contains tables of nonaxisymmetric flow around round cones in a wide range of machine numbers, angles of semisolution of the cones and angles of attack. The tables present exhaustive information on gas flow and can be used in practical work. The book is intended for researchers and engineers concerned with computer mathematics and programming, aerodynamics of flying craft and theoretical gas dynamics. The book can also be useful to teachers, advanced students and graduate students of higher educational institutions.

TABLE OF CONTENTS (abridged):

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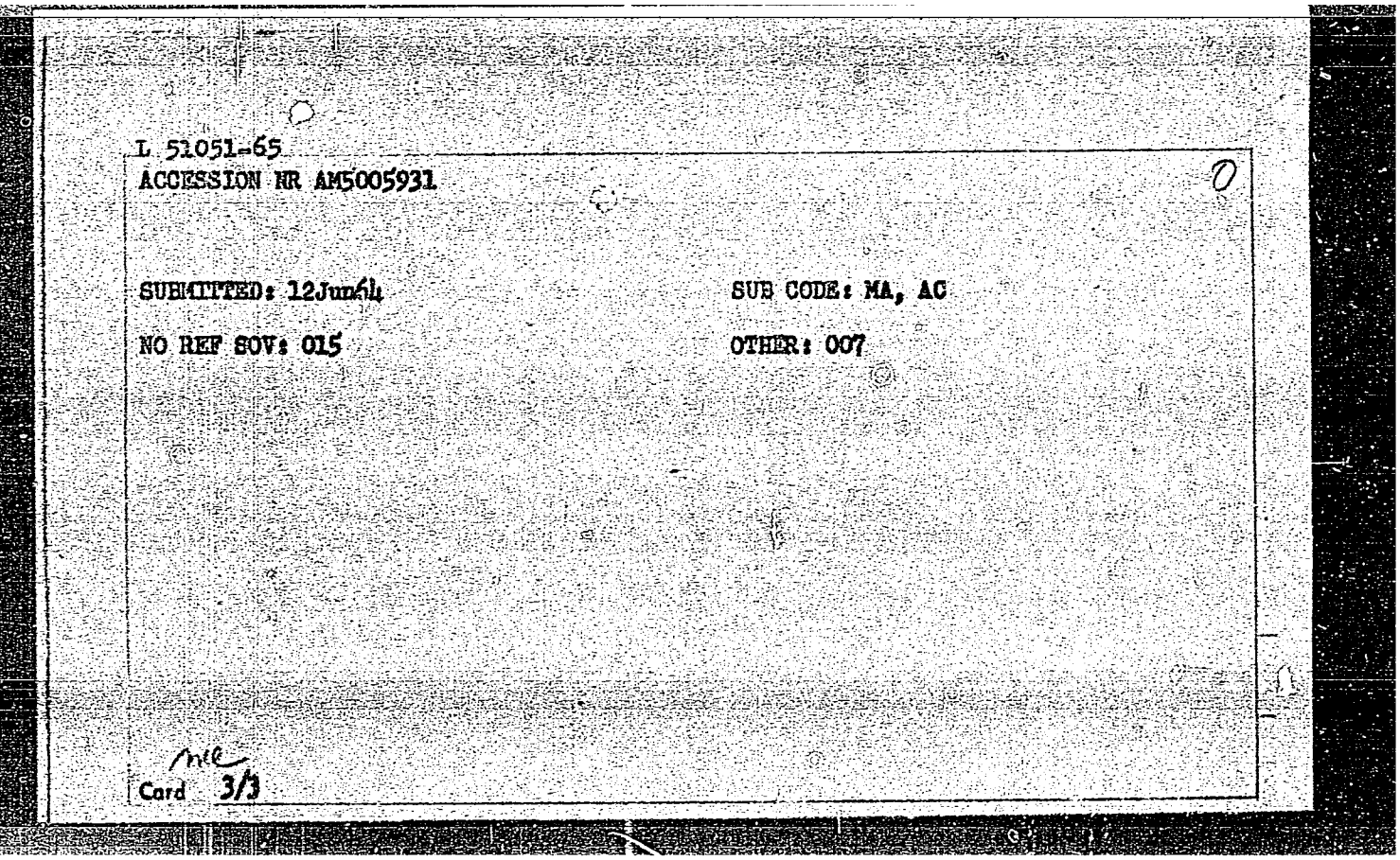


L 51051-65
ACCESSION NR AM5005931

SUBMITTED: 12Jun64 SUB CODE: MA, AC

NO REF SOV: 015 OTHER: 007

Card 3/3

SLONIM, I.Ya.; LY[illegible], A.N.; [illegible], Ya.[illegible]; [illegible], [illegible]; [illegible], [illegible].F.

Shape of nuclear [illegible] [illegible] [illegible] [illegible] [illegible] the second derivative absorption line is recorded. [illegible] 7 no.[illegible]:[illegible]45-[illegible] F [illegible].

1. [illegible]

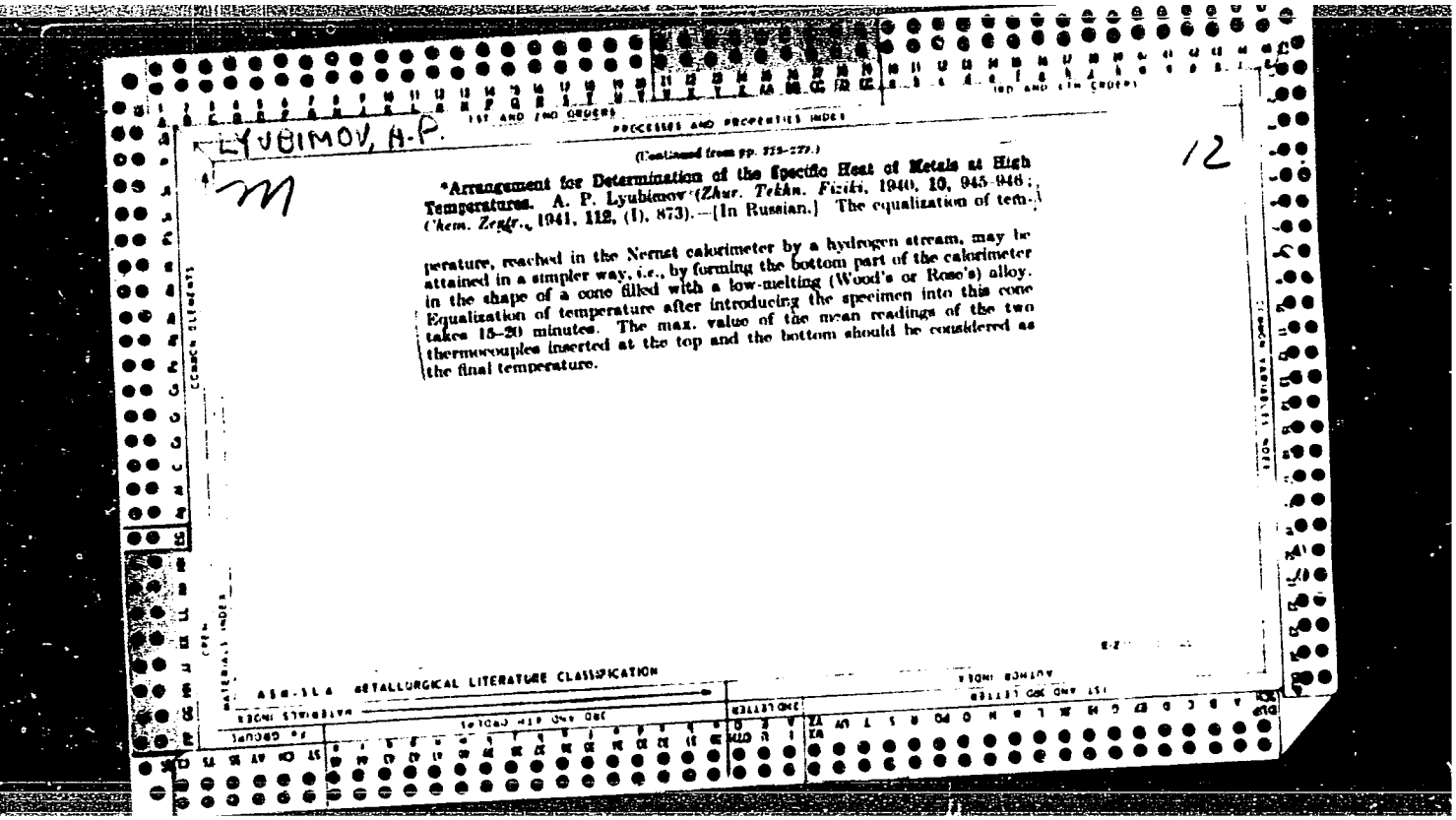
LYUBIMOV, A.N.; VARENIK, A.F.; ZIMINA, K.I.; MATVEYEV, Ye.L.; MALAKHAYEV, Ye.M.

Method for finding the optimum location for the magnet of a nuclear magnetic resonance spectrometer of high resolving power. Zav. lab. 31 no.8:1023-1025 '65. (MIRA 18:9)

1. Nauchno-issledovatel'skiy institut po pererabotke nefti.

LYUBIMOV, A.P. [deceased]

Determination and selection of the course of sequence in aerial photographic timing. Trudy TSNIIGAIK no.105:33-56 '55. (Photography, Aerial) (MLRA 9:6)

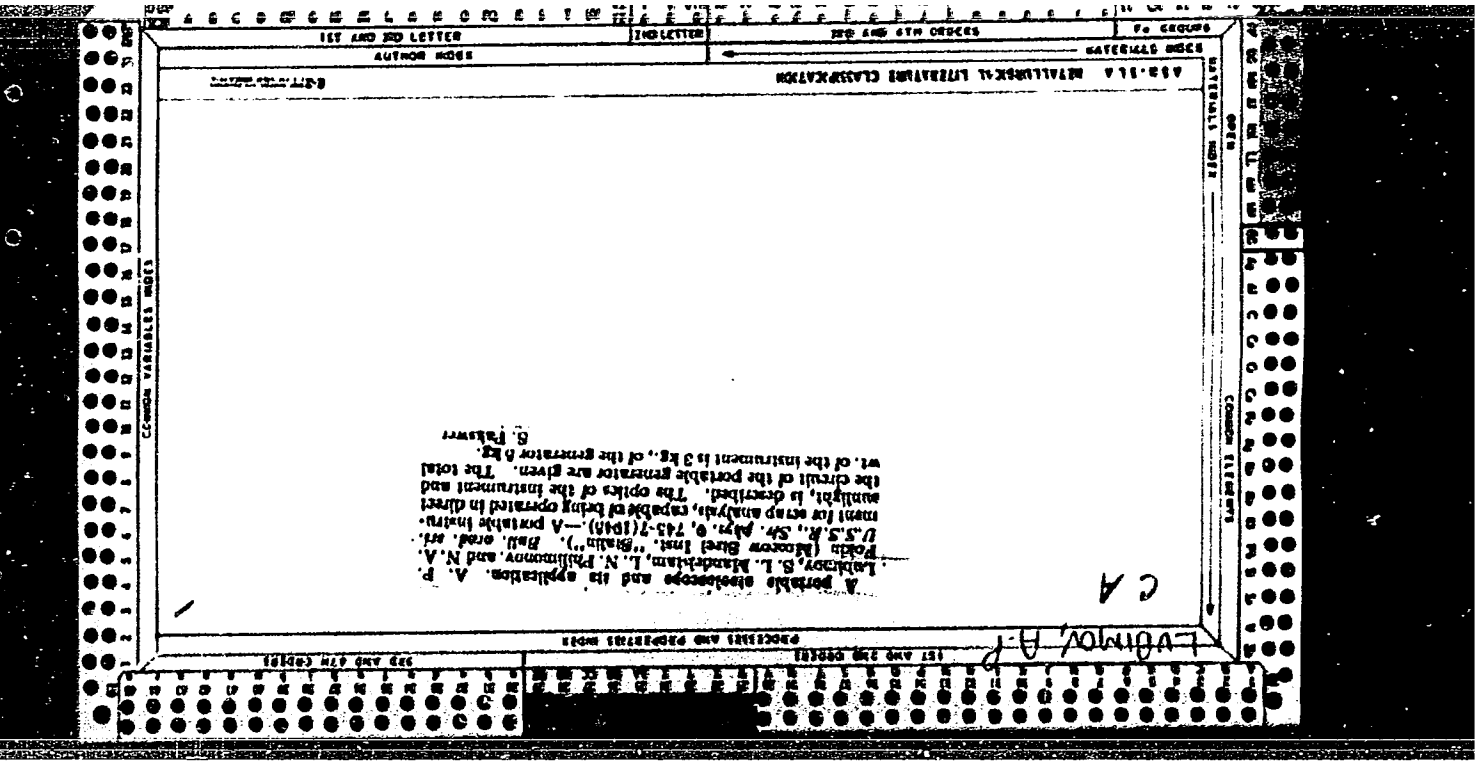


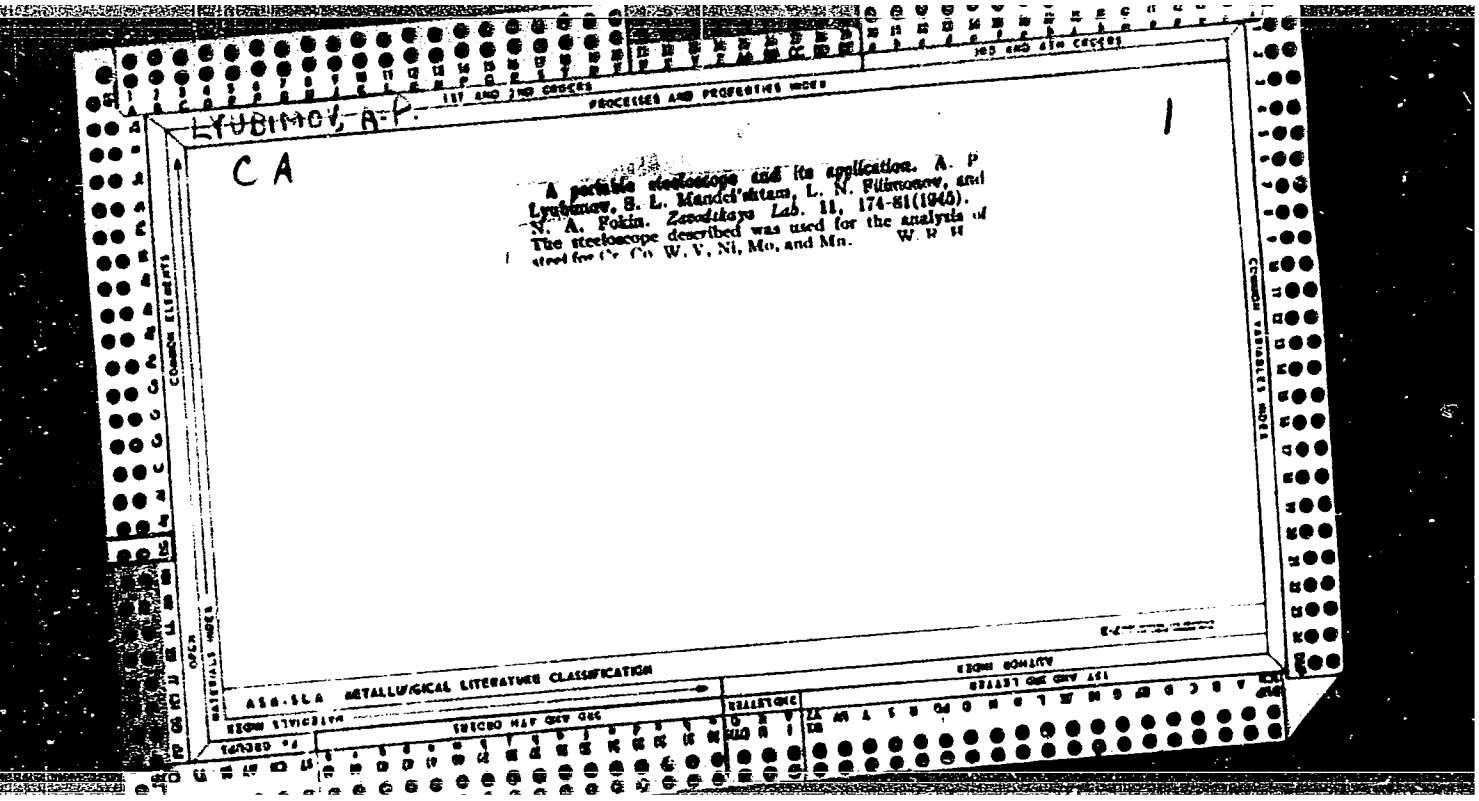
LYUBIMOV, A.P.

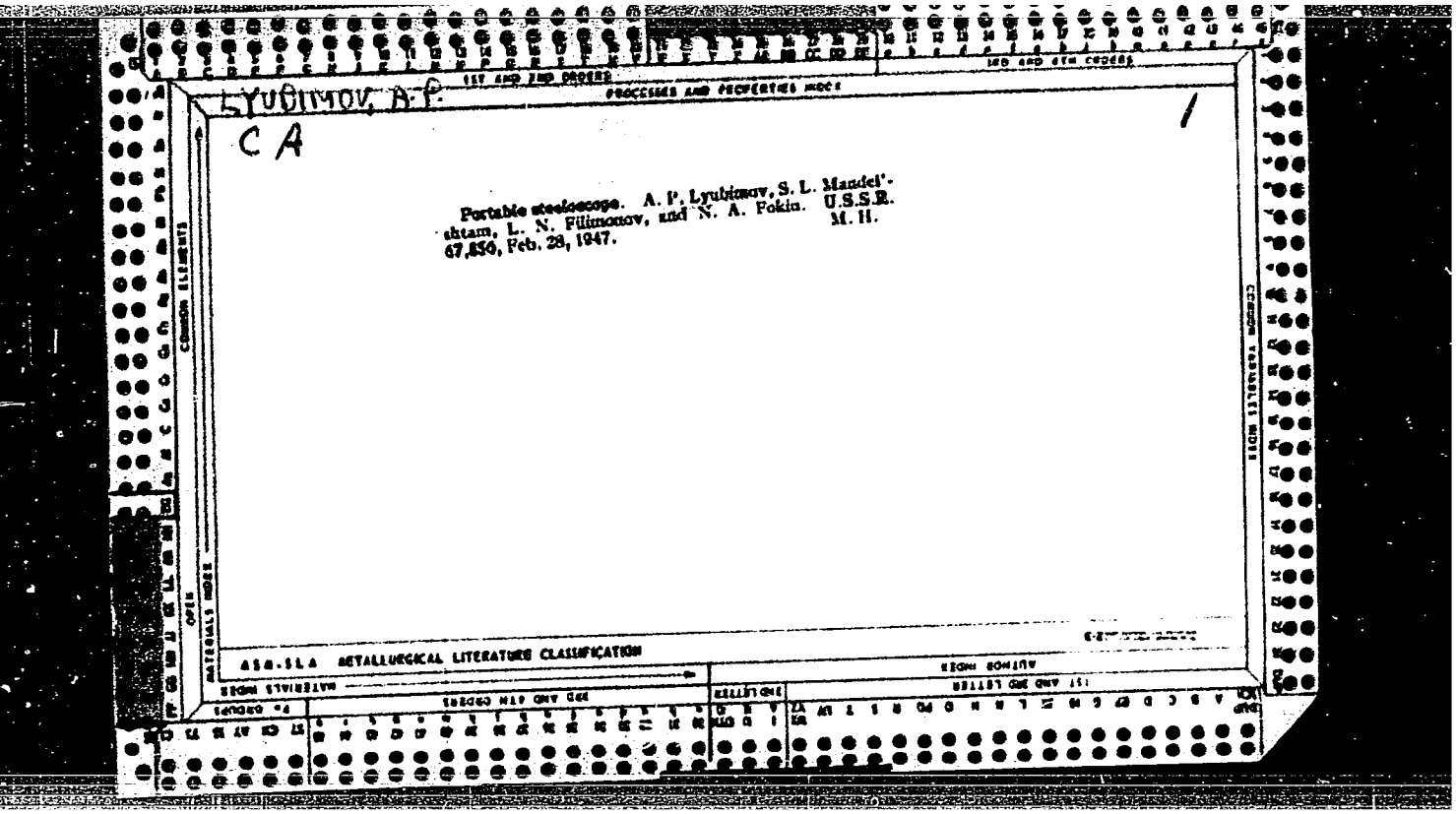
12

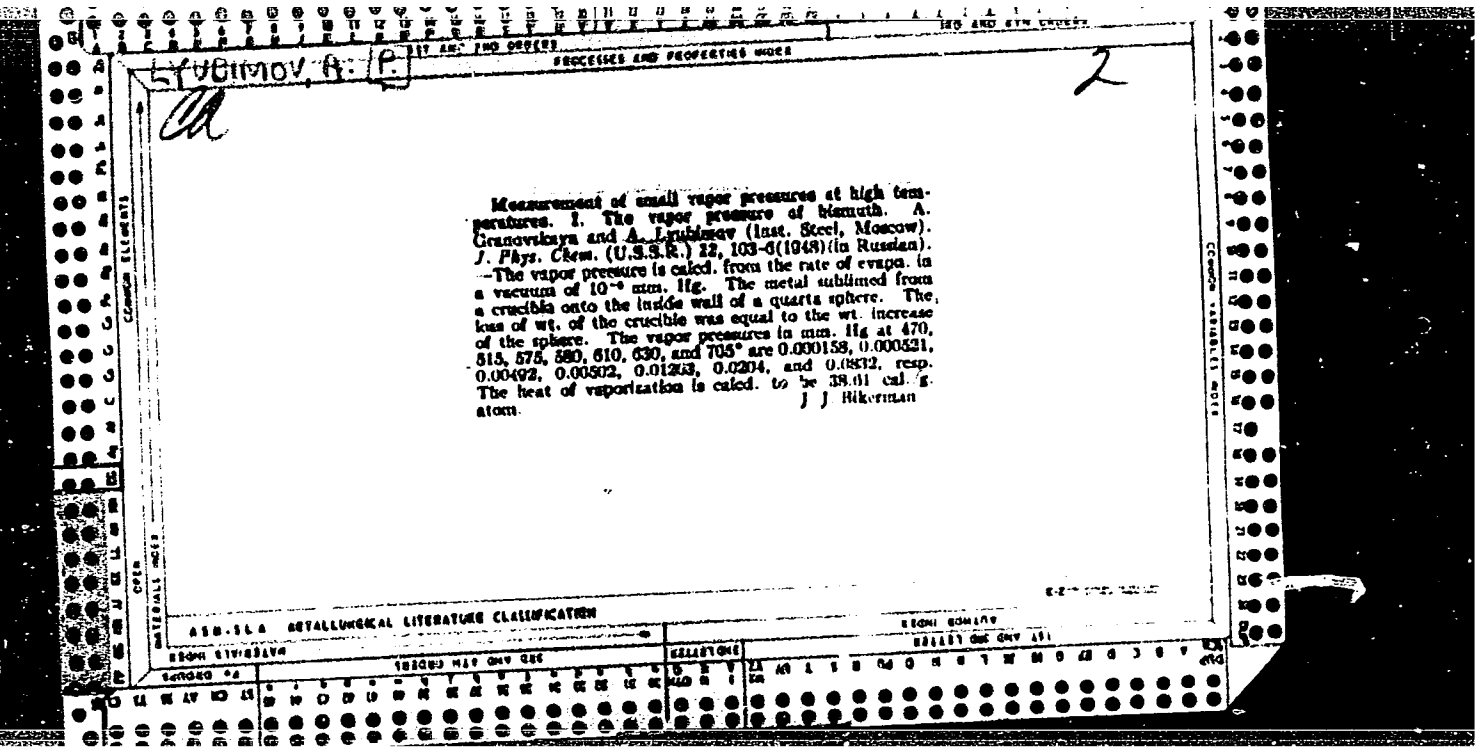
(Continued from pp. 775-777.)

*Arrangement for Determination of the Specific Heat of Metals at High Temperatures. A. P. Lyubimov (*Zhur. Tekhn. Fiziki*, 1940, 10, 945-946; *Chem. Zentr.*, 1941, 112, (I), 873).—[In Russian.] The equalization of temperature, reached in the Nernst calorimeter by a hydrogen stream, may be attained in a simpler way, i.e., by forming the bottom part of the calorimeter in the shape of a cone filled with a low-melting (Wood's or Rose's) alloy. Equalization of temperature after introducing the specimen into this cone takes 15–20 minutes. The max. value of the mean readings of the two thermocouples inserted at the top and the bottom should be considered as the final temperature.









Grubimov, A. P.

2

Measurement of small vapor pressures at high temperatures. I. The vapor pressure of bismuth. A. Granovskaya and A. Lyublimov (Inst. Steel, Moscow). *J. Phys. Chem.* (U.S.S.R.) 22, 103-6(1948)(in Russian). —The vapor pressure is calcd. from the rate of evapn. in a vacuum of 10^{-6} mm. Hg. The metal sublimed from a crucible onto the inside wall of a quartz sphere. The loss of wt. of the crucible was equal to the wt. increase of the sphere. The vapor pressures in mm. Hg at 470, 515, 575, 580, 610, 630, and 705° are 0.000158, 0.000521, 0.00492, 0.00502, 0.01263, 0.0204, and 0.0832, resp. The heat of vaporization is calcd. to be 38.01 cal./g. atom. J. J. Bikerman

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

67T23

LYUBIMOV, A.

Apr 1948

USSR/Chemistry - Tin
Chemistry - Vapor Pressure

"Measurement of Small Vapor Pressures at High Temperatures: II, Vapor Pressure of Tin," A. Granovskaya, A. Lyubimov, Chair of Gen Chem, Chair of Phys, Moscow Inst of Steel, 2 pp

"Zhur Fiz Khim" Vol XXII, No 4 - [illegible] 527 - 8

Previous work was on studies conducted on the pressure of tin vapors at low temperatures. Use same method here to measure tin vapor pressure in the range of 730 - 950° C. Tabulate results obtained. Submitted 22 Jul 1947.

67T23

[redacted]

GRANOVSKAYA, A.A.; LYUBIMOV, A.P.

Measuring small vapor pressures at high temperatures. Part 5. Partial vapor pressures of components in the system iron - phosphorus. Zhur.fiz.khim. 27 no.10-1443-1445 O '53. (MLRA 6:12)

1. Institut stali im. I.V.Stalina, Moscow.
(Vapor pressure) (Iron) (Phosphorus)

LYUBIMOV A.P.

GRANOVSKAYA, A.A., dotsent; LYUBIMOV, A.P., professor, doktor tekhnicheskikh nauk.

Investigation of thermodynamic properties of binary melts using radioactive isotopes. Sbor.Inst.stali no.32:79-96 '54. (MLRA 10:5)

1.Kafedra obshchey khimii i fiziki.
(Systems (Chemistry))
(Radioistopes)

LYUBIMOV, A. P. (Prof., Ph. D.); GRANOVSKAYA, A. A.;

"Investigation of the Thermodynamic Properties of Components in Liquid Iron-Sulphur and Iron-Silicon Systems," in book The Application of Radioisotopes in Metallurgy, Symposium XXXIV; Moscow; State Publishing House for Literature on Ferrous and Nonferrous Metallurgy, 1955.

A. A. GRANOVSKAYA; Prof. A. P. LYUBIMOV, Ph. D./Chair of General Chemistry; Chair of Physics, Moscow Inst. of Steel im I. V. Stalin.

LYUBIMOV, A. P. (Prof.)(Ph. D.); GRANOVSKAYA, A. A.

"Investigation of the Thermodynamic Properties of Components in a Liquid Iron-Chromium System," In book The Application of Radioisotopes in Metallurgy, Symposium XXXIV; Moscow; State Publishing House forLiterature on Ferrous and Nonferrous Metallurgy, 1955.

Prof. A. P. LYUBIMOV, Ph. D.; A. A. GRANOVSKAYA, Assistant Chair of General Chemistry, Moscow Inst. of Steel im. I. V. Stalin.

D-4

Category : USSR/Atomic and Molecular Physics - Heat

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 873

Author : Lyubimov, A.P., Belashchenko, D.K.
Title : Radiation-Colorimetric Method of Determining the Specific Heat of Metals.

Orig Pub : Sb. Mosk. in-ta stali, 1955, 33, 3-11

Abstract : Description of a new method for determining the specific heat C_p of metals, based on simultaneous measurement of the temperature T of the cooling specimen and of the quantity of heat Q, delivered by the specimen to the surrounding medium. The specific heat was calculated from the equation $C_p = Q/(m dT/dt)$, where m is the mass of the specimen, and t the time. The specimen is placed inside a double-wall quartz cover and is first heated in vacuum by high frequency current. The heat radiated by the specimen is absorbed by cooling water flowing between the walls of the cover, and is determined from the temperature difference of the cooling water ahead and past the cover. The values of C_p were determined for Fe-C, Fe-Cu and Armco-iron alloys at 250 -- 950°. Another version of the method, in which the metal is heated by a heater placed inside the specimen, is described. In the latter version the specific heat can be measured both while heating and while cooling. The

Card : 1/2

Category : USSR/Atomic and Molecular Physics - Heat D-4

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 873

accuracy of the method increases with increasing temperature the error amounts to less than 3% above 600°.

Card : 2/2

GRANOVSKAYA, A.A., dotsent, kandidat khimicheskikh nauk; LYUBIMOV, A.P., professor, dekter tekhnicheskikh nauk.

Investigating the thermodynamic properties of the constituents of iron-sulfur and iron-silicon systems in the liquid state. Sbor.Inst.stali 34: 66-90 '55. (MLRA 9:7)

1.Kafedra obshchey khimii i kafedra fiziki.
(Iron-silicon alloys) (Systems (Chemistry))

LYUBIMOV, A.P., professor, doktor tekhnicheskikh nauk; GRANOVSKAYA, A.A., dotsent, kandidat khimicheskikh nauk.

Investigating the thermodynamic properties of the constituents of iron-chromium systems in the liquid state. Sbor.Inst.stali 34:95-101 '55. (MLRA 9:7)

1.Kafedra fiziki i Kafedra obshchey khimii.
(Iron-chromium alloys) (Chromium-isotopes)

137-58-4-8521

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 4, p 314 (USSR)

AUTHORS: Lyubimov, A.P., Lyubitov, Yu.N.

TITLE: Measurement of the Vapor Pressure of Liquid Indium by Means of the Mass Spectrograph (Izmereniye davleniya parov zhidkogo indiya s pomoshchyu mass-spektrografa)

PERIODICAL: Sb. Mosk. in-t stali, 1957, Vol 36, pp 191-195

ABSTRACT: A method of mass spectrometric determination of the vapor pressure of a metal over its liquid phase has been developed. The test metal was In (99.97% pure). The tests were run on the MS-4 mass spectrograph with certain changes in the circuit of its ion source. The test metal was placed in a special depression in a quartz capsule within the heater. A thermocouple for temperature measurement was introduced into the interior space of the capsule until it touched the inside of the depression. The free surface of the fused metal was positioned opposite the opening in the ion source box. Ionization of the vapor phase was by an electron beam of 90 and 96 ev energy from the filament of an electron gun. The heater design made it possible to obtain

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Measurement of the Vapor Pressure (cont.)

temperatures of up to 1065°K. The minimum (600-650°K) was governed only by the possibilities available for amplifying the ion flux and the presence of background. It is noted that the criterion for the minimum is not the temperature, but the appropriate vapor pressure, the limit of which is 10^{-10} mm Hg for In. The measurements and calculations were based on the use of In^{115} (95.5%). Certain values were checked by means of In^{113}. The experiments made it possible to measure the vapor pressure of metallic In in the 646-1065°K temperature interval, and the heat of evaporation of In, which proved to be 55.74 kcal/mole, was determined by the slope of the curve for the relation of vapor pressure to temperature. It was found that the mass spectrometric method makes it possible to determine only the relative values of the expressions for vapor pressure P f(T). Knowledge of the transient coefficient B, is required to determine the absolute values of the vapor pressure. It was found that the value of the ionic flux all other conditions being equal, depends upon the energies of the electrons ionizing the vapor. The curve of values of ionic flux relative to acceleration potential of the electron gun shows a maximum. The position of the maximum varies with variation in temperature.

1. Indium (Liquid)--Vapor pressure- Measurement 2. Indium (Liquid) L G
--Mass spectrum 3. Mass spectra--Applications 4. Metals--Mass spectrum

Card 2/2

IVANOV, Fedor Mikhaylovich; LYUBIMOV, A.P., prof., red.; KATRENKO, D.A., red.; KOLESNIKOVA, A.P., tekhn. red.

[Vacuum] Vakuum. Pod red. A.P. Liubimova. Moskva, Gos. izd-vo tekhniko-teoret. lit-ry, 1958. 55 p. (MIRA 11:8)
(Vacuum)

SOV/16[illegible]-58-1-2/33

AUTHORS: Lyubimov, A. P., Granovskaya, A. A., Berenshteyn, L. Ye.

TITLE: The Investigation of the Ternary System Fe-Cr-Ni in Liquid State (Issledovaniye troynoy sistemy Fe Cr Ni v zhidkom sostoyanii)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 1, pp. 7-10 (USSR)

ABSTRACT: In the present paper the influence of the composition of the liquid phase on the evaporation rate of the components in the ternary melt Fe Cr Ni was investigated. In this investigation the composition of the vapor phase was determined in relation to the concentrations of the components in the melt as well as to the temperature. The investigations in the melt Fe Cr Ni were divided into wider concentration ranges viz. for iron and nickel from 0 to 100 % and for chromium from 0 to 35 %.
The composition of the vapor phase was determined in an apparatus especially constructed for this purpose.
All investigations were carried out at temperatures of 1633°, 1681° and 1737°C.

Card 1/2

The Investigation of the Ternary System Fe Cr Ni in Liquid State

The experimental results showed that the ternary system Fe Cr Ni represents an ideal solution between the components.
It was found that a decrease of the nickel content in the vapor phase occurs when it is decreased in the melt. The chromium content in the vapor phase increases according to the decrease of the nickel content in the melt.
The ternary system Fe Cr Ni did not show any considerable deviation from the ideal solution up to a temperature of [illegible]°.
There are 4 figures and 2 references, [illegible] of which is Soviet.

ASSOCIATION: Moskovskiy institut stali
(Moscow Steel Institute

SUBMITTED: October 8 1957

Card 2/2

SOV/76-32-7-21/45

AUTHORS: Lyubimov, A. P., Granovskaya, A. A., Berenshteyn, L. Ye.

TITLE: The Investigation of the Thermodynamic Properties of the Binary System Iron-Manganese in Solid State (Issledovaniye termodinamicheskikh svoystv dvoynoy sistemy zhelezo-marganets v tverdom sostoyanii)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 7, pp. 1591-1596 (USSR)

ABSTRACT: In the investigations the authors employed the method of open surface evaporation with the calculations of the partial vapor pressures being carried out according to the Langmuir formula. It was found that the partial pressure may be obtained without a determination of the evaporation surface and of the absolute quantity of each component on the basis of the equation by Gibbs-Duhem by means of a graphical integration. The method described may be employed for the determinations of the vapor pressure in all concentration intervals, except the case that the vapor pressures of the components differ by more than an order of 1,5, as in the case of greater

Card 1/3

The Investigation of the Thermodynamic Properties of the Binary System Iron-Manganese in Solid State

differences of the vapor pressures of the components reliable results may only be obtained with small concentrations of the easily volatile components. The determinations were carried out at 1213, 1363 and 1447° with the above mentioned system using acceptors (platelets on which the condensation took place); the latter were investigated by spectralanalytical methods, using standards (the origin of which is described). As according to the method described it is not possible to determine the vapor pressure of the pure iron at the temperature given, this value was taken from publications. The experimental values obtained for the molar content of the components in the vapor phase, the vapor pressure of the components as well as the activities and activity coefficients are given in a table. From the results may be seen that the system iron-manganese according to its thermodynamic properties is close to the ideal solution state. The deviations from the ideal state which are to be observed at lower temperatures decrease at higher temperatures so that the system may be called ideal at 1447°. There are 3 figures, 2 tables, and 4 references, 3 of which are Soviet.

SOV/76-[illegible]/45

The Investigation of the Thermodynamic Properties of the Binary System Iron-Manganese in Solid State

ASSOCIATION: Moskovskiy institut stali im. I. V. Stalina
(Moscow Institute of Steel imeni I. V. Stalin)

SUBMITTED: March 12, 1957

1. Iron-manganese systems--Thermodynamic properties

Card 3/3

AUTHOR: Lyubimov, A. P., Nobens, V. Ya., Rakhovskiy, V. I. 76-32-8-12/37

TITLE: A Mass-Spectrometric Determination of the Thermodynamic Properties of Binary Metallic Systems (Opredeleniye termodinamicheskikh kharakteristik metallicheskikh dvoynykh sistem pri pomoshchi mass-spektrometra)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 8, pp. 1804-1808 (USSR)

ABSTRACT: A method for the determination of the partial pressures of vapors based on an evaporation and a subsequent analysis of the gaseous phase is employed. An apparatus of the type MS-1 served for the mass-spectrometric measurements. It had to be improved in some respects, as e.g. by a focusing of the ion beam, the avoiding of a contact between the material to be investigated and the heating element, and others. A diagram of the apparatus as well as a description and the technique employed are given. The systems Fe - Ni and Fe - Co were investigated at 1463°, 1583° and 1753°K, with the isotopes Fe^{56}_{26}, Co^{59}_{27} and Ni^{58}_{28} being used for the measurements.

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A Mass-Spectrometric Determination of the Thermodynamic Properties of Binary Metallic Systems

SOV/76-32-9-12/37

The determination of the partial vapor pressures was carried out by means of the Gibbs-Duhem (Gibbs-Dyugem) equation; the values of the thermodynamic activities, of the activity coefficients as well as of the partial molar free energies are given in a table. It was found that the two systems agree well with the Raoult's (Rault) theorem and thus are close to the ideal case. At a concentration of 80 % nickel there is, however, a deviation from the ideal case, which fact is explained by the presence of "residues" of a superstructure Ni_3Fe.

There are 2 figures, 6 tables, and 4 references, 3 of which are Soviet.

ASSOCIATION: Institut stali im. I.V. Stalina Moskva (Institute of Steel imeni I.V. Stalin, Moscow)

SUBMITTED: March 12, 1957

Card 2/2

SO[illegible]

Translation from: Referativnyy zhurnal, Metallurgiya [illegible] SSR

AUTHORS: Belashchenko D K., Lyubimov A P

TITLE: The Viscosity and Electrical Properties of Molten Alloys of Certain Binary Systems (Vyazkost' i elektricheskiye svoystva rasplavov nekotorykh dvoynykh sistem)

PERIODICAL: Sb Mosk in-ta stali, 1958, Vol 38, pp [illegible]

ABSTRACT: A method of joint measurement of the viscosity and the electrical conductivity, χ, of liquid melts of metals at [illegible]°C is developed. The properties of molten Sn, Pb, Tl, Cu, Fe and Ni and of systems having intermetallic compounds with a predominant bonds, supercooling on crystallization are investigated. Sb-Sn, Cd-Sb, Cd-Cu, Bi-Tl, Pb-Tl, and Fe-Ni. A comparison between the thermodynamic and the kinetic properties is found upon comparison thereof. A tendency toward weakening of the ordered distribution of atoms is found in equi-atomic molten alloys of the Sb-Sn, Pb-Tl, and Bi-Tl systems, resulting in the appearance of corresponding maxima and minima on the ν and χ isotherms. When energetically the components in these alloys predominated a tendency toward ordering

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The Viscosity and Electrical Properties of Molten Alloys (con't)

of the structure was observed. This is expressed in a corresponding change in ν and χ. The structure of melts of the Cd-Sb and Cd-Cu systems is further removed from the ideal. The presence therein of a specific placement of particles in a manner corresponding to CdSb or Cd_3Sb_2 (in the case of Cd-Sb) or the electronic compound Cd_8Cu_5 (in the case of Cd-Cu) is hypothesized. The latter is used as an example for illustrating the determining influence of electron concentration upon χ properties. In the Cd-Sb, Bi-Tl, and Pb-Tl systems a and χ hysteresis is found. This is explained by the assumed supercooling of melts of these systems upon crystallization of melts. It is shown that and χ are "structure-sensitive" properties of molten Me and alloys, a fact that is particularly valuable for studying their internal structures at high temperatures when X-ray diffraction analysis encounters significant experimental difficulties. Bibliography: 19 references.

A R

Card 2/2

TUROVSKIY, B.M.; LYUBIMOV, A.P.

Effect of silicon on the viscosity and the electrical resistance of iron-carbon alloys. Izv.vys.ucheb.zav.; chern. met. no.5:8-15 '60. (MIRA 13:6)

1. Moskovskiy institut stali.
(Iron alloys—Elect ic properties) (Silicon)

18:3200;18.8100

77681
SOV/148-60-1-4/34

AUTHORS: Turovskiy, B. M., and Lyubimov, A. P.

TITLE: Viscosity and Electrical Resistance of Liquid Alloys of Iron-Silicon System

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, 1960, Nr 1, pp 24-27 (USSR)

ABSTRACT: This article gives the results of measuring the viscosity and electrical resistance of liquid alloys of the Fe-Si system and pure liquid silicon. The authors used a method of measuring the kinematic viscosity and electrical conductivity, which gave the means to determine the values of these quantities in the process of one experiment. The kinematic viscosity was calculated on the basis of experimentally determined logarithmic decrement of damped free torsion fluctuations of cylindrical crucible with liquid alloy. The electrical conductivity was calculated by the value of the stationary angle of torsion of a sample in a rotating magnetic field.

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Viscosity and Electrical Resistance of Liquid Alloys of Iron-Silicon System

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The development of the method was connected with a number of difficulties in carrying the experiment at elevated temperatures at which the chemical activity of alloy's components is especially high. For protection of the alloys from oxidation, helium was continuously passed through the furnace. The experiments were conducted at 1,420-1,620° C temperature range. The alloys were prepared from the electrolytic iron and technically pure silicon (approximately 99.9%) re-melted in a vacuum. The selected measure of relative electrical resistance was $\rho = \frac{10h}{\alpha - \alpha_o}$ (h = height of sample in liquid state, α = torsion angle of suspended system with liquid alloy; α_o = torsion angle of suspension system proper. The data of spectral analysis showing silicon content in the melts are given in the table.

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Nr. of Alloy	0	1	2	3	4	5	6	7	8
Content Si, % (weight)	Pure Iron	10,0	20,0	24,0	31,6	43,2	54,0	67,0	Pure Silicon
Content Si, % (at)	Pure Iron	18,11	33,11	38,59	47,89	60,26	70,04	80,15	Pure Silicon

The experimental results are given in Fig. 1, 2, 3, and 4. The results of the above experiments are in good agreement with published French and German data. They confirm the existence of a relation between the shape of isothermal curves of viscosity and the electrical resistance of liquid alloys, the state diagram, and the degree of system's deviation from ideal. There

Viscosity and Electrical Resistance of Liquid Alloys of Iron-Silicon System

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SOV/148-60-1-4/34

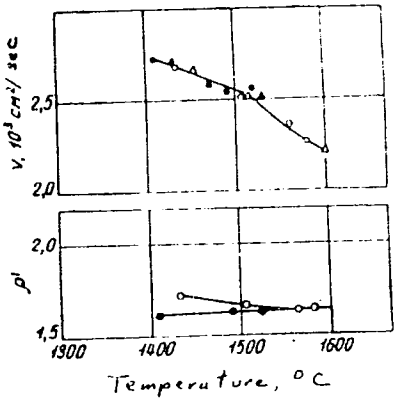

Fig. 1. Temperature relationship between viscosity and relative electrical resistance of liquid silicon: Experiment 1; (△) heating; (▲) cooling; Experiment 2: (○) heating; (●) cooling.

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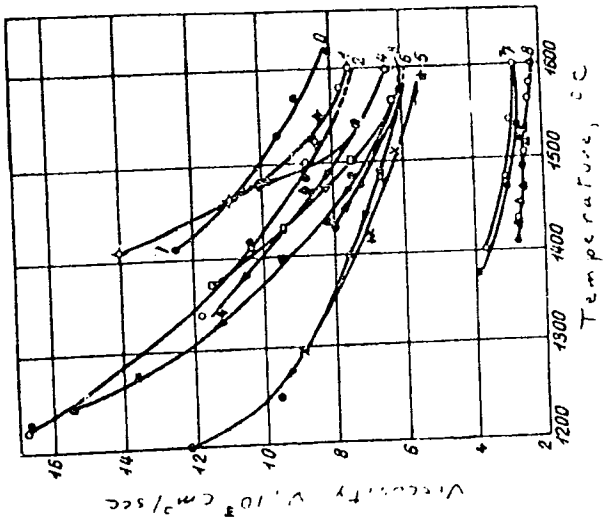

Fig. 2. Temperature relationship of viscosity of liquid alloys of Fe-Si system. The numbers of curves correspond to various alloys' compositions, silicon content of which is given in the table.

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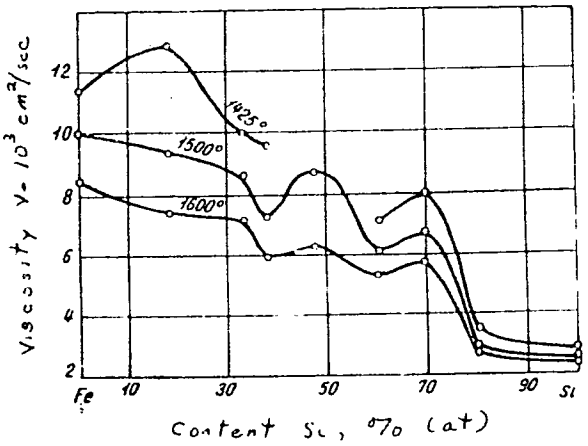

Fig. 3. Isothermal curves of viscosity of liquid alloys of Fe-Si system.

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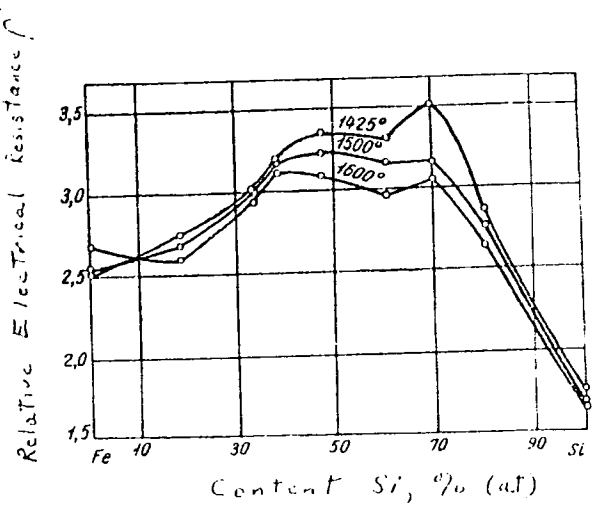

Fig. 4. Isothermal curves of relative electrical resistance of liquid alloys of Fe-Si system.

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Viscosity and Electrical Resistance of Liquid Alloys of Iron-Silicon System

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SOV/148-60-1-4/34

are 4 figures; 1 table; and 5 references, 2 Soviet, 1 French, 2 German.

ASSOCIATION: Moscow Steel Institute (Moskovskiy institut stali)

SUBMITTED: December 15, 1958

Card 8/8

S/020/60/135/004/033/037
B004/B056

AUTHORS: Rakhovskiy, V. I., Lyubimov, A. P., and Garmash, V. M.

TITLE: Penetration of Silver Into Tungsten

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 4, pp. 906 - 908

TEXT: The authors discuss the problem of the strength of power current terminals. Since a high melting point and good thermal conductivity are desirable for such contacts, repeated attempts have been made to use alloys on the base of silver and tungsten. In this connection, penetration of Ag into W plays an important role. Tungsten plates (0.015×0.4×1.2 cm) were annealed in liquid silver containing radioactive Ag^{110}. The quartz crucible with the sample was placed in a tube which was evacuated to 10^{-4} mm Hg filled with He up to somewhat over 1 atm, and annealed at 1000° C for 8, 16, and 24 hours, and at 1080° C for 4, 8, 12, and 16 hours. Temperature was controlled by a chromel-alumel thermocouple and a [illegible]-1

Card1/3

(PPTV-1) potentiometer, and regulated by an ЛАТР-1 (LATR-1) type autotransformer. Then, the tungsten plate was extracted from the liquid Ag, adhering Ag was etched away by means of dilute HNO_3 at 40° C in a ТС-15М (TS-15m) type thermostat, and the activity of W was determined by БСП (VSP) counter. At both temperatures, a linear increase in activity with the annealing time was observed. From this it was concluded that it is not diffusion which takes place but another penetration process whose rate was constant and equal to $7.62 \cdot 10^{-8}$ g/cm^2·sec at 1080° C. The activation energy of this process was 825 kcal/g-atom. The observed sharp decrease in strength of tungsten indicated that liquid silver etches away the grain boundaries of tungsten, and that silver atoms fill the "pores". According to experimental data, such a process would depend linearly on time. There are 2 figures and 3 references: 1 Soviet and 2 German.

Penetration of Silver Into Tungsten

S/020/60/135/004/033/037
B004/B056

ASSOCIATION: Vsesoyuznyy elektrotekhnicheskiy institut im. V. I. Lenina (All-Union Electrotechnical Institute imeni V. I. Lenin), Moskovskiy institut stali im. I. V. Stalina (Moscow Steel Institute imeni I. V. Stalin)

PRESENTED: June 22, 1960 by P. A. Rebinder, Academician

SUBMITTED: June 14, 1960

Card 3/3

LYUBIMOV, A.P.; GARMASH, V.M.; MAKHOVSKIY, V.I.

Investigating the heat capacity of tungsten and copper-base ceramic metal compositions. Poroshk. met. 1 no.5:20-25 S-O '61. (MIRA 15:6)

1. Moskovskiy institut stali imeni I.V. Stalina i Vsesoyuznyy elektrotekhnicheskiy institut imeni Lenina.
(Powder metals--Thermal properties)

TUROVSKIY, B.M.; LYUBIMOV, A.P.

Viscosity and electric resistance of liquid alloys of the system Fe - C. Izv. vys. ucheb. zav.; chern. met. no.2:15-20 '60. (MIRA 15:5)

1. Moskovskiy institut stali.

(Iron alloys)
(Liquid metals--Electric properties)
(Viscosimetry)

S/148/62/000/011/006/013
E111/E435

AUTHORS: Koledos, L.A., Lyubimov, A.P.

TITLE: Influence of small additions of iron on the viscosity and electrical resistivity of liquid aluminium

PERIODICAL: Izvestiya vysshykh uchebnykh zavedeniy. Chernaya metallurgiya, no.11, 1962, 140-145

TEXT: The viscosity was determined on Al-Fe (up to 4.36% Fe) alloys in a covered graphite cylindrical crucible by measuring the damping decrement of torsional oscillations; this was combined with determining the electrical resistivity by measuring the stationary angle of twist. Density data for pure aluminium and the alloys and resistivity values for pure aluminium were taken from the literature. Before the measurements, the alloys were held for 30 minutes at the required temperature. During the first heating higher viscosity values were obtained, probably because of the persistence of structure. The method of preparation of the solid specimen, which is them melted, affects the difference between viscosity curves obtained on heating and on cooling. The temperature dependence of viscosity was exponential and the

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S/148/62/000/011/006/013
E111/E435

viscosity increased smoothly with iron content without any peculiarities in the eutectic-concentration regions. A similar relation holds for electrical resistance. For pure Al and alloys with 1.1 and 2 wt.% Fe, the activation-energy values calculated from the slope of log viscosity vs 1/absolute temperature plots agree well with each other. This can be explained by assuming that aluminium atoms are "fixed" within the first coordination sphere of a dissolved iron atom. The higher activation energies and the relatively greater divergence between experimental and calculated viscosity values at 800°C of the 4.36% Fe alloy can be explained by overlapping of the zones of interaction of dissolved iron atoms and aluminium atoms. There are 3 figures and 2 tables.

ASSOCIATION: Moskovskiy institut stali i splavov
(Moscow Institute of Steel and Alloys)

SUBMITTED: January 4, 1962

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001031210006-7"

KOLEDOV, L.A.; LYUBIMOV, A.P.

Effect of small additions of iron on the viscosity and electrical resistance of liquid aluminum. Izv.vys.ucheb.zav.; chern.met. 5 no.11:140-145 '62. (MIRA 15:12)

1. Moskovskiy institut stali i splavov.
(Aluminum-iron alloys—Testing) (Liquid metals—Testing)

LYUBIMOV, A.P.; PAVLOV, S.I.; RAKHOVSKIY, V.I.; ZAYTSEVA, N.G.

Method for measuring the effective ionization cross sections and ionization coefficients of metal atoms during an electronic impact. Izv. AN SSSR. Ser. fiz. 27 no.8:1060-1064 Ag '63. (MIRA 16:10)

1. Vsesoyuznyy elektrotekhnicheskiy institut im. V.I.Lenina.

KOLEDOV, L.A.; LYUBIMOV, A.P.

Viscocity of diluted aluminum-base metallic solutions. Izv. vys. ucheb. zav.; chern. met. 6 no. 9:136-141 '63. (MIRA 16:11)

1. Moskovskiy institut stali i splavov.

BOKAREVA, N.M.; GOTGIL'F, T.L.; YERETNOV, K.I.; KOLEDOV, L.A.; LYUBIMOV, A.P.

Viscosity of tin and its alloys with nickel. Izv. vys. ucheb. zav.; chern. met. 8 no.9:8-12 '65. (MIRA 18:9)

1. Moskovskiy institut stali i splavov.

GVOZDEVA, L.I.; LYUBIMOV, A.P.

Connection between thermodynamic properties and viscosity.
Izv. vys. ucheb. zav.; chern. met. 8 no.9:13-16 '65.
(MIRA 18:9)

1. Moskovskiy institut stali i splavov.

GVOZDEVA, L.I.; LYUBIMOV, A.P.

Viscosity and structure of eutatic melts. Izv. vys. ucheb. zav.; chern. met. 8 no.7:16-19 '65. (MIRA 18:7)

1. Moskovskiy institut stali i splavov.

L 12174-66 EWT(m)/EWP(t)/EWP(z)/EWP(b) IJP(c) JD/HW

ACC NR: AP6000171 SOURCE CODE: UR/0148/65/000/009/0008/0012

AUTHOR: Bokareva, N. M.; Gotgil'f, T. L.; Yeretnov, K. I.; Koledov, L. A.; Lyubimov, A. P.

ORG: Moscow Institute of Steel and Alloys (Moskovskiy institut stali i splavov)

TITLE: Viscosity of tin and of its alloys with nickel

SOURCE: IVUZ. Chernaya metallurgiya, no 9, 1965, 8-12

TOPIC TAGS: tin alloy, nickel containing alloy, fluid viscosity, metal melting, atom

ABSTRACT: The elucidation of certain semiempirical patterns of relationship between the viscous properties of melts and their molecular structure is of major practical significance. To this end, the authors chose for investigation a Sn-Ni system (zone-refined 99.9997% pure Sn and electrolytic Ni) containing up to 9% (at.) Ni. Viscosity was studied in a He atmosphere by measuring the damping decrement of the torsional oscillations of a cylindrical crucible of spectrally pure graphite containing the melt. The viscosity of Sn-Ni alloys was determined in two series of measurements. In the first series the damping decrement was measured during both the heating and the cooling of specimens. Alloys containing 0.51, 1.8, 3.0, 5.45 and 9.0% (at.) Ni were investigated. All the alloys revealed hysteresis phenomena (due to the presence of minute i purities -- oxides -- in zone-refined Sn), and in the alloys with 5.45 and

Card 1/3 UDC: 669.6'24-154:532.13